Book Reviews

Life Cycle Inventories for the Production of Detergent Ingredients

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This report has already been announced in this Journal (Vol. 4, No 4, p. 212, 1999). It was elaborated under contract of UBA, Berlin, and Öko-Institut e.V., Freiburg (Brsg.) and belongs to a substantial effort made by the German Environmental Agency (UBA) as well as by Swiss industry and governmental agencies to create a data base (this work) as well as a guide for evaluating and using detergents in an ecologically sensible and responsible way. The method used by Oeko-Institut Freiburg for the latter task was Life Cycle Assessment, supplemented by social and economic aspects ("Produktlinienanalyse") [1].

The LCI-report reviewed here used several existing sources of data and also contains new data collected for the purpose of the study in order to fill gaps. The goal of the study was to harmonise and upadate these data and publish them as life cycle inventories. To pursue this goal the following measures have been taken:

1. A uniform methodology for all life cycle inventory analyses was applied
2. Joint basic data on energy production, transport and basic chemicals were used
3. Compatible LCI parameters in a given format were utilised

The most important data source for the active ingredients (surfactants) is the result of a truly international effort: the so-called "ECOSOL cradle-to-factory-gate LCIs" of the most important surfactants used in European detergents. This study was conducted by Franklin Associates (David Janzen [2]) under contract of the members of CEFIC's sector group "European Centre of Studies on Linear Alkylbenzene", hence the name. The final ECOSOL-report has been rewied by myself, Gustav Sundström and Rainer Grießhammer [3].

LCI data on the so called "builders" have been collected and updated by EMPA, e.g. [4,5]. The data base can claim to represent average European production conditions around 1995. The system boundaries are "cradle-to-factory-gate" and, thus, do not contain the production of the actual detergents by mixing, spraying etc., the use phase and the final disposal in sewage treatment plants and surface waters. Many LCA-practitioners are used to EMPA data and the format created for the famous BUWAL-Reports on packaging materials, e.g. the most recent one [4]. In the detergent report, therefore, existing and revised/updated data was brought into this familiar format. The constituents of detergents included in the report comprise surfactants, builders and some ancillary compounds:

Surfactants: Sodium Linear Alkylbenzene Sulphonate (LAS), linear Alcohol Sulfate from palm oil (FAS), Soap, non ionic Alcohol Ethoxylates with 7 EO-chains (AE), cationic surfactant (Esterquat from coconut palmoil and tallow)

Builders: Sodium silicates (different Si/Na ratios and water contents, including layerd sodium silicate SKS-6), Sodium-tripolyphosphate (STPP), Zeolite A (powder and slurry in water), Polycarboxylates (co-builder)

Bleaching agents: Hydrogen peroxide, Sodium perborate (different hydrates), Sodium percarbonate

Ancillary compounds: Carboxymethylcellulose (CMC), Optical brightener (DAS-1 and DSBP).

Since commercial detergents are complicated mixtures of many components (surfactants, builders, etc.), the user of the tables can build her or his LCI or LCA starting from the LCI data given, if additional information about the production, use and disposal of the detergents to be analysed is available. It should be taken in mind, however, that the unit of comparison is not simply weight (as in the case of the LCIs presented here), but the functional unit. A careful definition of the functional unit is therefore of paramount importance for the correct use of the data presented. LCI-data cannot replace the goal definition and scoping phase according to ISO14040 (no simple "adding up"). A comparison between different detergents is only possible, if the benefit (here: the cleaning) is equal for the different formulations. If different temperatures and/or amounts of water are needed for the detergents compared, this has to be included in the systems compared and calculated appropriately.

The report includes a lucid expert review according to ISO 14040 (§ 7.3.2) by Rolf Bretz, comments by the authors and a discussion about the use of sum parameters in inventories (COD, BOD; DOC, TOC), again by Rolf. Bretz. This discussion at the end of the report shows that much remains to be done in the field of data requirements and data format, especially with regard to the use of inventory data in Life Cycle Impact Assessment. In this respect I wonder, whether – in the future – ingredients added in trace amounts (e.g. enzymes), which hardly contribute to the basic inventory data, will have to be considered in the inventory phase. The same may be true for odour compounds and other additives used in very small amounts in commercial detergents. These compounds are not supposed to influence the inventory data in stand alone LCIs but possibly the Life Cycle Impact Assessment (LCIA) of the final products.

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